Electronic Supplementary Information

1. Preparations

1.1. WO₃/TiO₂ nanocomposite fibers

The ethanol solution containing ca. 1.1 g of the acid treated ACF and 1.75 g WCl₆ was sonicated for 40 min. After that, ACF was removed from the solution, washed and was added to a Teflon-lined stainless steel autoclave which contains 2 ml TTIP in 70 ml of ethanol solution. The autoclave was sealed and heated at different temperature (90, 120 and 150°C) under autogenous pressure for 24 h. After that, the autoclave was cooled down. The product was rinsed with anhydrous ethanol to remove excess TTIP and dried at 60 °C. Finally, the product was calcined at a temperature of 550°C (ramp at 5 K min⁻¹) in a flow of O₂ (60 mL min⁻¹) for 8 h to remove the ACF template.

1.2. Fe₂O₃/TiO₂ and SnO₂/TiO₂ nanocomposite fibers

The ethanol solution containing ca. 1.1 g of the acid treated ACF and 1.3515 g FeCl₃• $6H_2O$ (or 1.7530 g SnCl₄•5H₂O) was sonicated for 40 min. After that, ACF was removed from the solution, washed and was added to a Teflon-lined stainless steel autoclave which contains 2 ml TTIP in 70 ml of ethanol solution. The autoclave was sealed and heated at 120°C under autogenous pressure for 24 h. After that, the autoclave was cooled down. The sample was rinsed with anhydrous ethanol to remove excess TTIP and dried at 60 °C. Finally, the product was calcined at a temperature of 550°C (ramp at 5 K min⁻¹) in a flow of O₂ (60 mL min⁻¹) for 8 h to remove the ACF template.

1.3. Pt-WO₃/TiO₂ nanocomposite fibers and Pt-TiO₂ fibers

1 wt% Pt-WO₃/TiO₂ nanocomposite fibers and Pt-TiO₂ fibers were prepared by a photodeposited method using $H_2PtCl_6 \cdot 6H_2O$ as starting material.

2. Characterizations

X-ray diffraction (XRD) patterns were collected on a Bruker D8 Advance X-ray diffractometer with CuK_{α} radiation. The accelerating voltage and the applied current were 40 KV and 40 mA, respectively. Data were recorded at a scanning rate of 0.004 ° 2θ s⁻¹ in the 2θ range of 10 ° to 70 °. Morphology of the sample was characterized by field Emission scanning electron microscopy (SEM) (JSM-6700F). The transmission electron microscopy (TEM) and high resolution transmission electron microscopy (HRTEM) images were measured by JEOL model JEM 2010 EX instrument at the accelerating voltage of 200 kV. X-ray photoelectron spectroscopy (XPS) measurements were performed on a PHI Quantum 2000 XPS system (PHI, USA) with a monochromatic Al K_{α} source and a charge neutralizer. All the binding energies were referenced to the C1s peak at 284.6 eV of the surface adventitious carbon. The specific surface area of the samples was measured by nitrogen sorption at 77 K on ASAP 2020 instrument and calculated by the BET method. UV-visible absorption spectra (UV-DRS) of the powders were obtained for the dry-pressed disk samples using a UV-visible spectrophotometer (Cary 500 Scan Spectrophotometers, Varian, USA). BaSO₄ was used as a reflectance standard in the UV-visible diffuse reflectance experiment.

3. Photocatalytic Reaction

The photocatalytic activity of 1% Pt-WO₃/TiO₂ and 1%Pt-TiO₂ was evaluated by the decomposition of methylene blue (MB) in an aqueous solution under visible light irradiations. 5 mg of photocatalyst was added into 80 mL of MB solution (10 μ mol/L). 500 W tungsten halogen lamp was positioned inside a cylindrical Pyrex vessel and surrounded by a circulating water jacket (Pyrex) to cool the lamp. A cutoff filter was placed outside the Pyrex jacket to completely remove all wavelengths less than 450 nm to ensure the irradiation with visible light only. Prior to irradiation, the suspensions were magnetically stirred in the dark for ca. 2h to ensure the establishment of an adsorption/desorption equilibrium. At given irradiation time intervals, 3 mL of the suspensions were collected, centrifuged, and filtered through a Millipore filter to separate the photocatalyst particles. The degraded solutions of MB were analyzed by a Varian Cary 500 Scan UV-vis spectrophotometer and the absorption peaks at 664 nm for MB were monitored. The percentage of degradation is reported as C/C₀. C is the absorption of MB at each irradiated time interval of the maximum peak of the absorption spectrum at wavelength 664 nm. C₀ is the absorption of the starting concentration when adsorption/desorption equilibrium was achieved.

Supporting Fig. S1 XPS spectra of WO_3/TiO_2 prepared at 120°C



The molar ratio of W/Ti in WO₃/TiO₂ prepared at 120°C is 24.26: 26.66.

Supporting Fig. S2 Elemental line profiles along the radial direction of the fiber indicate almost uniform dispersion of W and Ti in three products obtained at different solvothermal temperature (a) 120°C; (b) 90°C; (c) 150°C



Supporting Fig. S3 N₂ adsorption–desorption isotherms and corresponding pore size distributions for three WO₃/TiO₂ nanocomposite fibers at different solvothermal temperature, 90°C, 120°C, 150°C



Supporting Fig. S4 UV-vis DRS of products obtained at different solvothermal temperature.







Supporting Fig. S6 SEM images and elemental mappings of Fe₂O₃/TiO₂ prepared at 120°C



Supporting Fig. S7 SEM images and elemental mappings of SnO₂/TiO₂ prepared at 120°C



(a)













(e)



(f)





The molar ratio of Fe/Ti in Fe₂O₃/TiO₂ is 6.38: 30.13





The molar ratio of Sn/Ti in the SnO₂/TiO₂ nanocomposite fibers is 28.2: 23.44